

1.2 Developing Performance Measures—A Systematic Approach

Overview

Change might be inevitable, but all too often it occurs like an unguided missile seeking an elusive target at unpredictable speeds. For most activities, it is far better to manage change with a plan—one that includes clear goals and useful indications of progress toward a desired objective. Participants in an activity need to know what outcome is expected, where their work contributes to the overall goal, how well things are progressing, and what to do if results are not occurring as they should. This approach places performance measures right where they should be: integrated with the activity.

Such integration makes it possible for performance measures to be effective agents for change. If the measures quantify results of an activity, one only needs to compare the measured data with desired goals to know if actions are needed. In other words, the measures should carry the message.

Inappropriate measures are often the results of random selection methods. For example, brainstorming exercises can get people thinking about what is possible and provide long lists of what *could* be measured. Unfortunately, such efforts by themselves do not provide reliable lists of what *should* be measured. Unless the measures are firmly connected to results from a defined process, it is difficult to know what corrective actions to take and to predict with confidence what effects those changes will have.

If you want to be able to identify effective corrective actions to improve products and services, results of all key processes must be measured. In this way, one can identify specific processes that need to change if progress is not satisfactory.

For example, suppose sales are not meeting goals. What actions could be taken? The answer should depend on what is causing the problem. If poor technical service is causing customers to shy away, it will do no good to change or add sales personnel. Also, replacing technicians won't help if the poor service is caused by a lack of replacement parts. Suppose the replacement parts are on hand, but, unknown to the service personnel, the parts are defective? If proper measures are instituted for each key process (purchasing, inventory control, service, etc.), the cause for substandard results can be found quickly and corrected.

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SECTION 1: DEVELOPMENT PROCESSES

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Structure and Terminology

A structured approach provides a rational defensible basis for selecting measures and, should it become necessary, for making changes to the work processes. The viewpoint here is that achieving *goals* depends on the performance of interrelated sets of *activities* and *processes* that form a *system* to be managed. It follows that you can improve the selection of *performance measures* if they are based on the desired outcomes of the system and the results expected of each process in the system. In turn, this suggests a systematic approach to develop performance measures. This methodology will be described in the following sections.

Before the procedure is described, some key words should be discussed. Some of the terms used throughout this document could be interpreted differently by different readers; therefore, we are providing a short glossary of terms as they are used in this section. These are meant to be useful interpretations, not standard definitions.

A **system** is an interconnected set of **processes**, and a process is a set of **activities** that produce **products** or **services (results)**. Products and services are treated alike; that is the output of a process might be a product (like computer boards) or a service (like training). **Performance measures** are quantitative evaluations of the products or services of a process or system. **Metrics** are standards of measurement (such as length, area, frequency, mass, and so on).

In addition, there are terms such as **Performance Indicators** and **Indexes**. Dealing with these gets complicated because people use them in very different ways, and there is no one standard to which we can appeal. Some use *indicator* and *measure* interchangeably, while others see *indicators* as subsets of *measures*. Others see *indicators* as sets of related measures. Still others prefer *indexes*, often thought of as sets of related measures (sometimes individually weighted) that track changes compared to a reference. For example, the Consumer Price Index measures inflation by combining the prices of selected goods and comparing the results over time. Other examples include an Index of Indicators (*Business Week*) that report various areas of the economy (production, construction, etc.).

These more sophisticated concepts are important, but they are beyond the scope of this document. What is relevant here is that the more data that are combined, the broader the actions that must be taken to change the situation. The closer the measures are to the activity (i.e., less complex data), the more focused the actions that can be taken. Regardless of the complexity of the system, however, the development procedure to be described will apply.

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The Process

Developing performance measures has a definite relationship with Total Quality Management. Consider a quality process at AT&T:

AT&T Management & Improvement Steps

- A. Establish process management responsibilities.
- B. Define process and identify customer requirements.
- C. Define and establish measures.
- D. Assess conformance to customer requirements.
- E. Investigate the process for improvement opportunities.
- F. Rank improvement opportunities and set objectives.
- G. Improve process quality.

In this process, Tasks B, C, and D are the core of performance measure development. In fact, the systematic method to be described amounts to an elaboration of these three tasks. These three have been extended to the following six steps:

- 1. Decide the outcomes wanted.
- 2. Describe the major work processes involved.
- 3. Identify the key results needed.
- 4. Establish performance goals for the results.
- 5. Define measures for the goals.
- 6. Select appropriate metrics.

Each of these six steps will be discussed in the following sections. We will create a very small company, **Hackenstack Firewood**, that we can use to help us get a working knowledge of this systematic method for developing performance measures.

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Step 1: Describe the Outcomes Wanted

First Law of Performance: If you try to be the best at everything, you'll be the best at nothing.

Why are we doing this work? The answer is to achieve some outcome or objective (the words are used interchangeably in this process). As used here, objectives might not seem very definitive. However, they are very important because they set the direction for all processes in the system. Essentially, objectives (or outcomes) are statements of the wants, needs, and expectations of customers and other stakeholders. Objectives are the warm and somewhat fuzzy expressions that should form the mindset for all who are involved in the system. Examples are:

- Supply good pizza with superior delivery service.
- Be the safest airline and offer the lowest fares.
- Produce user-friendly VCRs.

Realize that the desired outcome sets the strategic direction of an enterprise. Consequently, tactical decisions about what the business does, how it is done, and what gets measured must relate to this strategic statement. The outcome or objective statement is a driving force for the selection of performance measures. In the end, what is done and measured somehow must connect with the desired outcome. For instance, to achieve its objective, that airline will have to spend resources for equipment and maintenance, not for in-flight meals and reserved seating. And, the measures should relate to safety and costs that drive ticket prices.

The choices of outcomes should be limited and selected carefully. A major consideration is focus; avoid the desire to be the best of everything. If you can pick something you are sure you would succeed at, that choice probably should be your number one objective. In the case of Hackenstack Firewood, the employees decided that the result of their effort should be to: *“Deliver firewood profitably at competitive prices.”*

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Step 2: Describe the Major Work Processes Involved

Second Law of Performance: People are more important than the process, but a good process is important to people.

What are we doing, and how are we (or should we be) doing it? Processes and their activities are the means to achieve the outcomes—the end results—identified in Step 1. To improve the chances of meeting objectives, be sure to understand the system, that is, the operational structure that underlies the effort. This task is not so obvious. The work we all do usually is part of a larger assignment that is, in turn, part of a larger job, and so on. Quite often, the work contributes to more than one assignment or, as is the case with Environment, Safety, & Health (ES&H) initiatives, it is not always clear which work responds to ES&H requirements and which tasks are unique to building the widget. Further, the interconnections between functions are not clearly defined or understood. Such complexities make it even more important to describe carefully the system you want to measure.

Often, the system already is in place, and with luck, it is documented (more or less). In any case, it is helpful to start with a simplified chart similar to the one in Figure 1.5. A system starts and ends with customers. In between are identifiable processes that transform inputs (like money or raw materials) into progressively more useful items (such as thread, then cloth, then clothing). Some interim products might be enablers, such as operating permits and instructions.

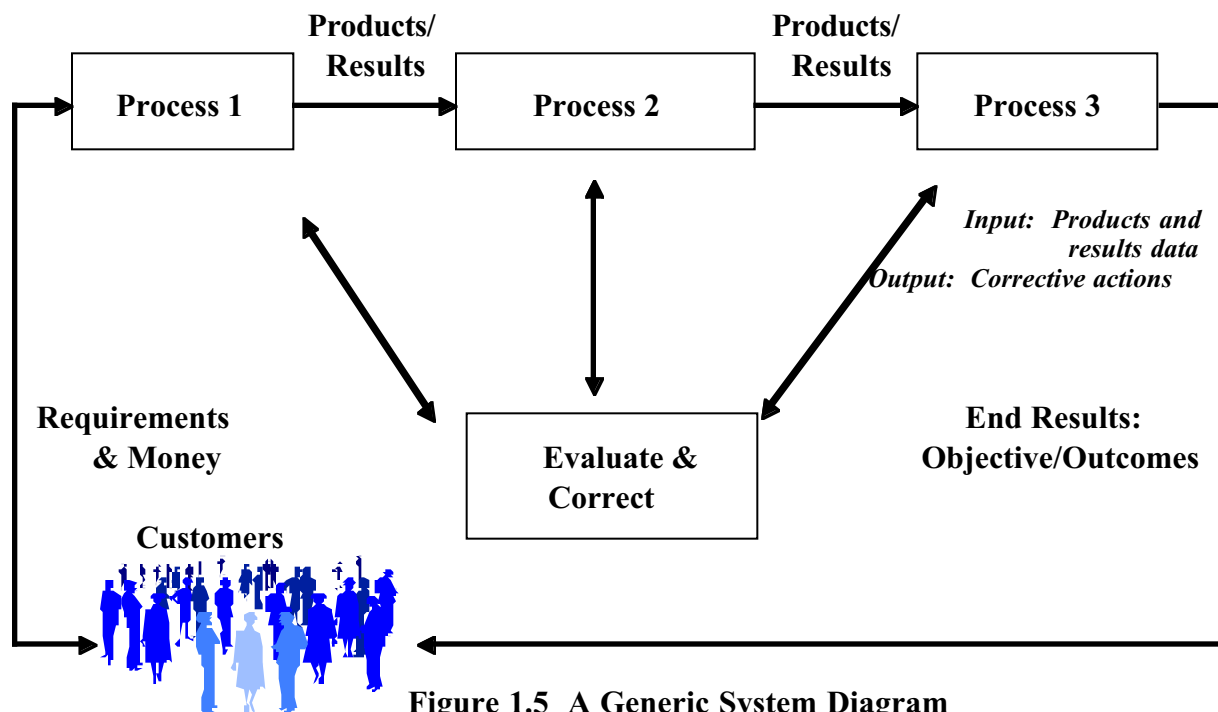


Figure 1.5 A Generic System Diagram

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Notice in Figure 1.6 the two-headed arrows between the Customers and Managers, and next to the “Evaluate & Correct” process. These indicate important give-and-take interactions, implying that the inputs and outputs involved are dynamic and subject to negotiations. For example, the price that customers are willing to pay is variable, as are the requirements for customer satisfaction. These factors will influence the measures to be selected later.

This part of the procedure is similar to benchmarking and should include interviews with the people doing the work. People often achieve desired results in spite of, not because of, the process that exists. Thus, examining work processes usually leads to discovery of some that can and should be improved. After examining their operations, the employees at Hackenstack Firewood decided that all of their activities could be placed in the four process blocks shown in Figure 1.6.

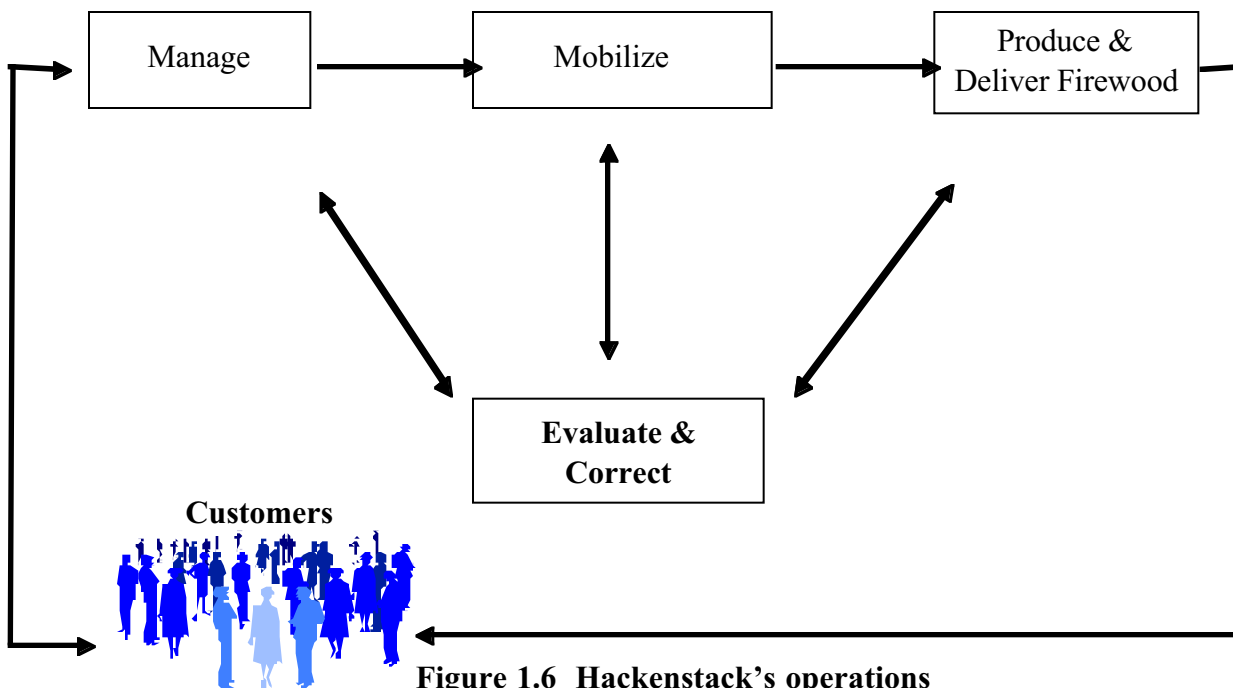


Figure 1.6 Hackenstack's operations

Next, the products (results) of the individual processes have to be identified so that measures can be developed. Note that after the six-step procedure is completed for the system, it is repeated for each process (Manage, Mobilize, Produce, and Deliver Firewood).

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Step 3: Identify the Key Results Needed

Third Law of Performance: If you can't describe it, you can't improve it.

What is produced? The “products” are the outputs or results of each process in the system. That is, the purpose of the activities in each process is to produce some result (a product or service) that is needed by other processes. Products of any given process are inputs to other connected processes in the system. Ultimately, the final products of the system are those that meet the strategic results—the objective—desired by the company.

For example, in the Hackenstack system, customers provide their requirements (such as amount and type of firewood) and money to Hackenstack management. These are identified as the most important products, or results, from customers, and so they will be included in the list of what is to be measured. In turn, the function of the “Manage” process is to provide the necessary paperwork and funding that is needed by the mobilization crew. Thus, the products of the first process are Funding, Permits, and Orders. They will be added to the list of items to be measured.

Next the mobilization crew prepares the field equipment (trucks, saws, etc.) and operating paperwork (maps, orders, permits, etc.) for the Field Crew who actually cut, stack, and deliver the firewood. Figure 1.7 shows the completed diagram, and Table 1.1 summarizes the processes and associated products.

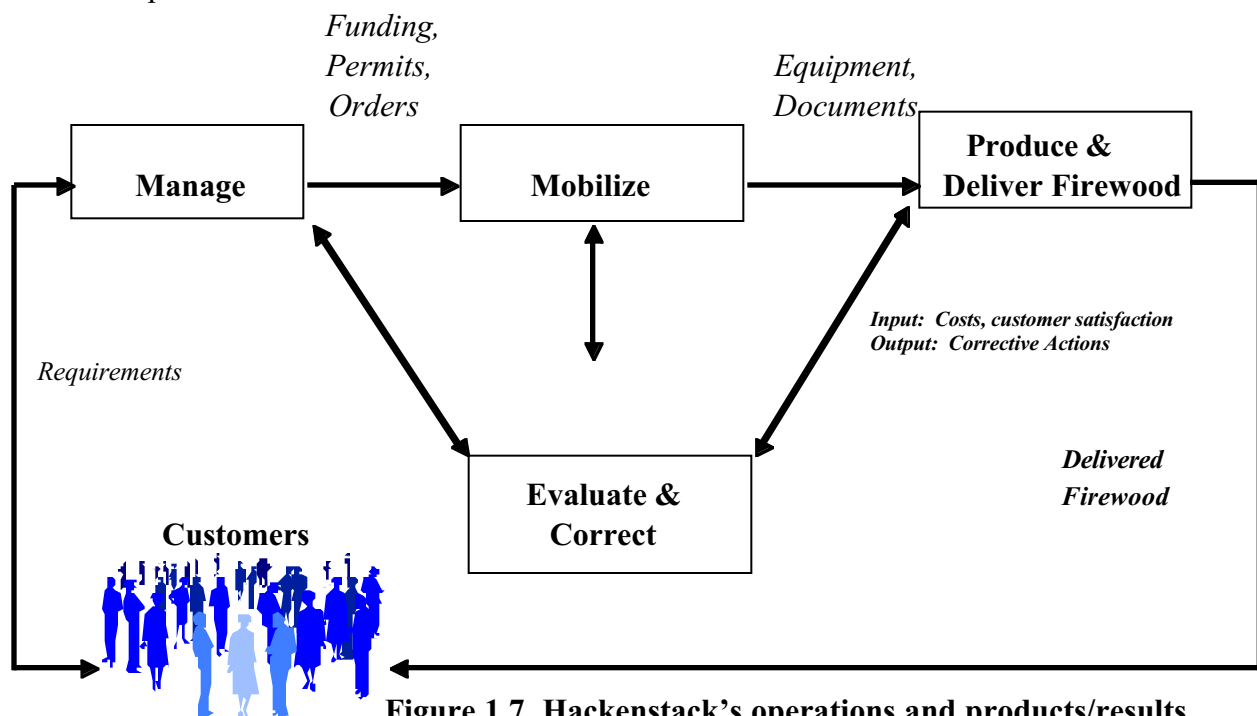


Figure 1.7 Hackenstack's operations and products/results

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Element/Process	Products/Results
Customers	Income, Requirements
Manage	Funding, Permits, Orders
Mobilize	Equipment, Documentation
Produce & Deliver Firewood	Delivered firewood
Evaluate & Correct	Costs, Customer Satisfaction

Table 1.1. Hackenstack Firewood’s Products/Results

Notice the “Evaluate & Correct” process. This function needs to be included in all systems if they are to be effective and efficient. This is the process that evaluates the performance data and prescribes changes that might be needed to meet the goals and objectives of the enterprise. This process is unique because, in addition to the products already mentioned, this process will examine customer satisfaction as well as costs throughout the system. While this is shown as a separate block, remember that the activities might very well be performed by the managers, mobilizers, and field crews. It is just the process, not the performer, that is identified here.

This discussion alludes to other issues, such as the politics and personal interactions that must accompany any such effort. For purposes of this document, however, suffice it to say that at every step, it is critical to obtain active endorsement and approval from all the involved and affected personnel. Otherwise, when goals aren’t being met, the time-honored practice of finger pointing will commence, and the problems won’t get resolved.

Step 4: Establish Performance Goals for the Results

Fourth Law of Performance: If you don’t have a goal, you can’t score.

How will I know when I get there? And an acid test: What will be done if progress isn’t satisfactory? There are many questions to ask about this step. Setting goals is very important because you can spend a lot of resources trying to meet them. You’re familiar with “no pain, no gain”? The **PAIN** is worth it if the goals are:

- Profitable (*Is it worthwhile to improve this? Favorable Benefit/Cost?*)
- Achievable (*Can it be improved? How? Who will do it?*)
- Important (*Does it matter to anyone?*)
- Numerical (*Without a number, you won’t know when you get there.*)

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The **GAIN** is in reaching the goals, because: Goals Are Improvement Numbers.

There are various ways to determine goals. One of the best methods is to ask the customer for each of the product(s) you listed in the previous step. In the system diagram, the “customer” is the group or individual receiving the product. Determine the Customer’s Satisfaction Factors (or Critical Success Factors, CSFs) that relate to each product. CSFs are the few key things that must be right for the process to be successful in the customer’s view. Section 2.1.2.7 includes a form that can be helpful when interviewing stakeholders to negotiate goals.

The goals should be stated in simple terms using numbers, such as “Deliver 500 completed manuals with fewer than three errors by the end of the month,” or “Improve the average student grade to a minimum of 93 within six months.”

Be sure to differentiate among lofty goals, stretch goals, and realistic goals. It is best to establish realistic goals—those you have a decent chance to reach—and after reaching them, establish new ones.

Here are some other considerations that might help to set goals:

- People involved in the process should be able to evaluate their contributions
- Is there an intrinsic limit?
- Is there a safety limit?
- Is there a required level?
- Watch out for diminishing returns; at some point, the return will no longer be worth the investment.
- Try benchmarking. Find out how well others are doing with similar processes.

Hackenstack’s Committee of the Whole developed the goals listed in Table 1.2. For example, after researching available wood supplies and performing a market survey, they decided that it would be reasonable for them to capture one fourth of the regional market, and that if the price is right, customers would purchase twice the amount of Hackenstack firewood in the coming year. To achieve these goals and meet their prime objective, they also found they would have to sell an average of 50 cords of wood each day at \$90 a cord. This, they believe, would keep customers and themselves happy. The remaining goals are the corresponding improvements needed in the products of the enabling processes to help meet the primary goals.

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Process	Products	Goals
Customers (Output)	Income Requirements	25% of the regional market Twice last year's volume
Manage	Funding Permits Orders	+10% - 0% of budget request 100% timely availability 98% error free
Mobilize	Equipment Documentation	97% uptime 99% error free
Produce & Deliver Firewood	Delivered Firewood	Customer cost £ \$ 90 cord 50 cords per day
Evaluate & Correct	Corrective Actions Surveys Costs Customer Satisfaction	100% on-time completion Positive perception $\geq 80\%$ +0%, -10% of budget See Customer output goals

Table 1.2 Hackenstack Firewood's Annual Goals

Step 5: Define Measures for the Goals

Fifth Law of Performance: Measuring the activity usually improves the activity, but not the result.

What can you use to track progress? Measures are descriptions of the items to be monitored. At this stage, measures should be described with relative terms like “percentage of the market” and “average prices.”

While there is no specific formula for selecting performance measures, there are some characteristics that are typical of the good ones. They:

- reflect results, not the activities used to produce results
- relate directly to a performance goal
- are based on measurable data

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- **contain normalized metrics for benchmarking**
- **are practical and easily understood by all**
- **provide a continual self assessment**
- **provide a benefit that exceeds the cost**
- **are accepted and have owners**

The first criterion is important because it is very tempting to select measures that are easy, while the right measures can be difficult. For example, the effects of training can be very hard to assess. It can be time consuming to interview employees and managers to find out if the training has improved worker abilities on the job. Rather than spend the time to do the interviews, people often change the measure to something like “the number of class hours completed” (essentially a useless measure unless it is accompanied by some measure of acquired skills).

Find appropriate measures by examining all the goals listed in the previous step. For example, Hackenstack’s goal to keep the selling price of firewood at or below \$90 a cord clearly implies that a measure of customer prices must be included. This simplicity will always be the case if the goals are chosen well and stated numerically. Difficulties occur when goals are poorly or incompletely stated, such as “satisfy the customer.” This would be difficult to measure because this goal doesn’t make it clear what will satisfy the customer! On the other hand, as the Hackenstack team observed, they must be satisfying the customer if sales and income are progressing toward or beyond the goal. There are other measures for customer satisfaction, of course. But to be useful, they must relate to some numerical goal.

While selecting measures, it is wise to remember that the idea is to be able to track progress and to be able to change processes (or activities, or the system) as needed to improve results. So, it will help to ask if the system measures you choose will be adequate to identify which process needs fixing. Also, consider what practical actions could be taken if any of the products are not progressing toward the goal fast enough. This thought experiment will help you select the right measures you need to help you make decisions later.

Finally, there must be a balance to the number of measures; after all, you can’t and shouldn’t measure more than you have time to evaluate.

Appendix C contains an extensive list of performance measures for various processes that may be helpful in determining measures for your situation.

Table 1.3 shows the measures selected by the Hackenstack Firewood team.

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Process	Products	Goals	Measures
Customers	Income	25% of the regional market	Income compared with regional markets
	Requirements	Twice last year's volume	Volume delivered compared with last year
Manage	Funding	+10% - 0% of budget request	Available funds compared with budget request
	Permits	100% timely availability	Permits available when needed
	Orders	98% error free	Proportion of error free orders
Mobilize	Equipment	97% uptime	Proportion of available equipment time
	Documentation	99% error free	Proportion of error free documents
Produce & Deliver Firewood	Delivered Firewood	Selling price £ \$90 cord	Average selling price
		50 cords per day	Average daily volume produced
Evaluate & Correct	Corrective Actions	100% on-time completion	Proportion of corrective actions completed on time
	Surveys	Positive perception $\geq 80\%$	Perception scores
	Costs	+0%, -10% of budget (90% to 100% of budget)	Spending

Table 1.3 Hackenstack Firewood Team's Measures

Step 6: Identify the Required Metrics

Sixth Law of Performance: If you know the score, you should be able to predict the outcome.

What specific things do I measure? Metrics—the actual measurements to make—should be fairly obvious from the descriptions of the measures composed in the previous step. Examine the measures statements and the goals to identify the units required for each term.

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For example, to support Hackenstack Firewood's goal to capture 25% of the regional market, the measure is the Company's income compared with the total dollars spent by customers in the region. This translates into dollars received by Hackenstack divided by the total dollars received by all firewood companies in the region during the same time period (perhaps monthly or weekly if possible). Notice that this fraction is dimensionless, expressing a percentage. The comparison, or ratio of two meaningful dollar figures creates a normalized measure that can be used for tracking and comparing with other similar businesses. Another way to normalize is to use a ratio of actual versus planned results. Metrics for a measure of yield quality might be the number of acceptable units produced divided by the total number of units produced.

Of course there are more issues that might need attention. Can Hackenstack find out the total income of their competitors? If not, what other measure can they consider? Perhaps the data only are available annually; that will not help because by the time they get the data, it will be too late to take any action. In this case, estimates based on projections from last year's regional income could be useful.

The complete summary of the Hackenstack Firewood system is tabulated in Table 1.4.

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Process	Products	Goals	Measures	Metrics *
Customers	Income	25% of the regional market	Income compared with regional markets	$\frac{\$ \text{ income}}{\$ \text{ regional}}$
	Requirements	Twice last year's volume	Volume delivered compared with last year	$\frac{\# \text{ cords this year}}{\# \text{ cords last year}}$
Manage	Funding	+10% - 0% of budget request	Available funds compared with budget request	$\frac{\$ \text{ funding}}{\$ \text{ requested}}$
	Permits	100% timely availability	Permits available when needed	$\frac{\# \text{ permits available}}{\# \text{ permits needed}}$
	Orders	98% error free	Proportion of error-free orders	$\frac{\# \text{ error-free orders}}{\# \text{ orders issued}}$
Mobilize	Equipment	97% uptime	Proportion of available equipment time	$\frac{\text{Equipment hrs. avail.}}{\text{Equipment hrs. needed}}$
	Documentation	99% error free	Proportion of error-free documents	$\frac{\# \text{ error-free documents}}{\# \text{ documents issued}}$
Produce & Deliver Firewood	Delivered Firewood	Selling price £ \$ 90 cord	Average selling price	$\frac{\$ \text{ income}}{\# \text{ cords sold}}$
		50 cords per day	Average daily volume produced	$\frac{\# \text{ cords stocked}}{\text{days}}$
Evaluate & Correct	Corrective Actions	100% on-time completion	Proportion of corrective actions completed on time	$\frac{\# \text{ completed on time}}{\# \text{ scheduled}}$
	Surveys	Positive perception \geq 80%	Perception scores	$\frac{\text{Total actual score}}{\text{Total possible score}}$
	Costs	+0%, -10% of budget	Spending	$\frac{\$ \text{ spent}}{\$ \text{ budgeted}}$

* The time intervals for each metric will be the same but may differ between measures.

Table 1.4 Hackenstack Firewood Company System Summary

Supporting Information

This section contains additional forms, worksheets, and a glossary that will help you use the process described above.

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Glossary

Activities: Actions that change resources from one form to another.

Goal: A specific, numerical result that is to be achieved by the process or system.

Indexes: Sets of related measures or indicators (sometimes individually weighted) that track changes compared to a reference.

Metrics: Standards of measure (such as length, area, frequency, etc.).

Normalize: Adjust metrics to allow comparisons with a reference or standard (usually done by using rates or percentages).

Objective: A statement of the general condition to be achieved (e.g., “work safely”).

Performance Indicator: Pointers comprising of related performance measures that reveal changes compared to a reference; that is, an indicator is composed of one or more measures

Performance Measure: Quantitative descriptions of the quality of products or services of a process or system.

Process: A set of activities that produce products or services.

Product: A tangible result of a process or system.

Service: Work done for others; also a result of a process or system.

System: A logical, interconnected set of processes.

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System Verification & Performance Goals

Interview Questions to Validate the System Definition

1. Verify the accuracy of each process block with the owners/representatives:

Question: Are these correct?

Input	Yes	No
Process	Yes	No
Products	Yes	No
Results desired	Yes	No

If any changes are suggested, specify them:

2. Identify the product goals:

Question: What are the most important expectations of the products; that is, what do you want to have happen as a result of these outputs?

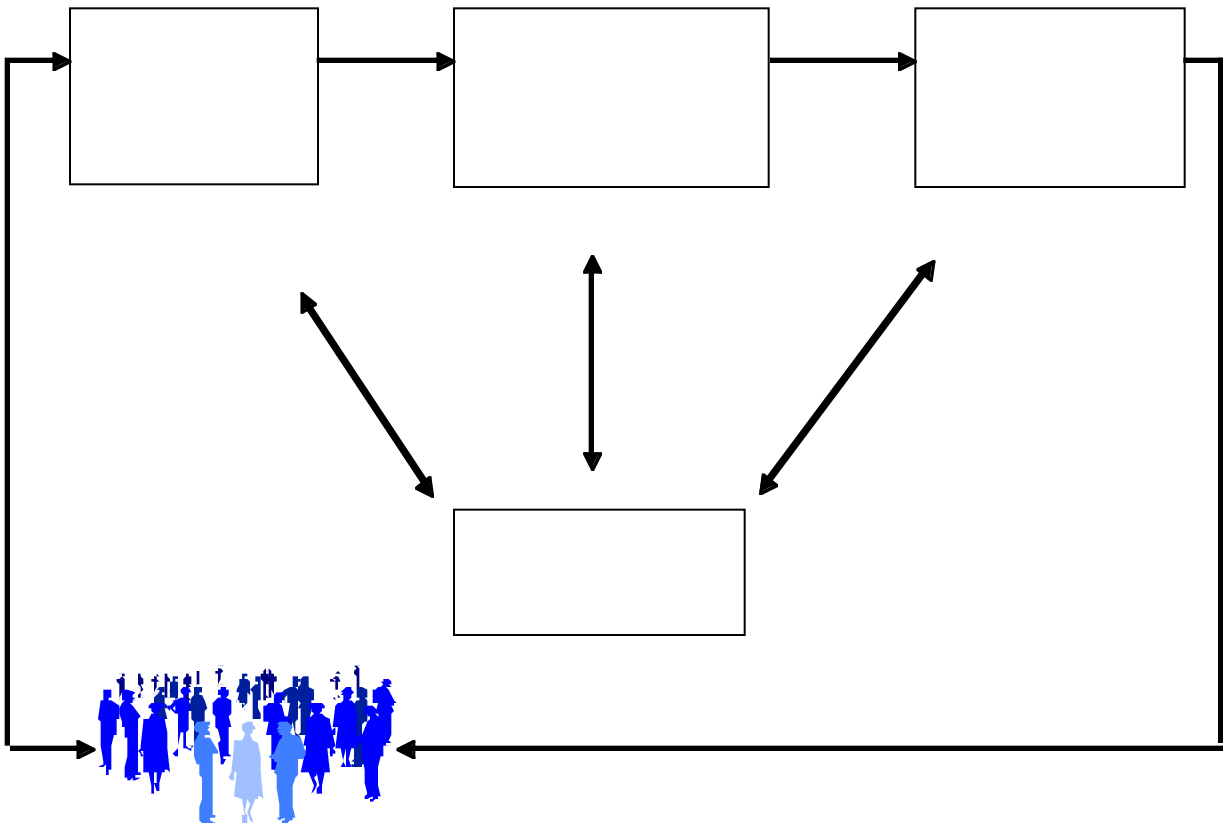
3. Determine if there are existing performance measures of value:

Question: Have you identified any specific, quantitative feedback that you want or require?

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System Flowchart



System Summary Table

PROCESS	PRODUCT	GOAL	MEASURE	METRIC

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